UNIVERSITY OF CALIFORNIA

Department of Physics
Berkeley, California 94720

January 31, 1966
Grant: NsG-387

Office of Grants and Research Contracts
Code SC
National Aeronautics and Space Administration
Washington 25, D. C.

Gentlemen:

During the period 1 August 1965 to 31 January 1966 the following activities were carried out under the NsG-387 Grant:

1. An extensive program of energetic particle measurements was carried out in the auroral zone. Eighteen balloon flights were made at Flin Flon, Canada, eight balloon flights and four Nike-Apache sounding rocket shots were made at Fort Churchill. A summary of these flights is attached including a statement of how the various activities were funded.

   The operation was extremely successful from the point of view of vehicle and instrument performance. A variety of interesting geophysical events occurred during these flights resulting in a great amount of important new information.

2. Reduction and analysis of the results from the auroral zone field expedition were begun during this report period. Considerable manual reduction was done and it will be possible to report many of the results at scientific meetings this spring. Also, a longer written report was planned. During this period work was done on automatic data processing equipment to handle all the balloon and rocket data. This is being designed, developed and tested by our laboratory personnel in order to reduce costs. It was necessary, however, to purchase a digital tape recorder to produce magnetic tapes containing the results in format suitable for computer processing.

3. The laboratory program of investigating energetic radiation detectors continued. Work was carried out especially on channeltrons, magnetic multipliers, and thin window Geiger-Mueller tubes of various construction. Also in our laboratory, work directly or indirectly related to the NsG-387 Grant was carried out on ionization chambers, proportional counters, and solid state detectors and a variety of scintillation counters.

[redacted]

4. Calculation of intercepts of geomagnetic lines of force through the geostationary satellite orbit with the earth's surface was continued by Mr. Gildener, an undergraduate student. The calculations were done both for the dipole case and for the solar wind deformed magnetosphere (Mead's model).

Personnel engaged on research supported by NASA Grant NsG-387 are:

Dr. Kinsey A. Anderson	Principal Investigator
Mr. Hugh Hudson	Res. Asst. (Graduate Student)
Mr. Arnold Miller	Senior Electronics Technician
Mrs. Elizabeth Bogard	Secretary-Stenographer
Mr. Bryan Loucks (half-time)	Laboratory Assistant
Mr. John Nidecker (half-time)	Laboratory Assistant

Sincerely yours,

Kinsey A. Anderson

Kinsey A. Anderson
Associate Professor
Principal Investigator

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DESCRIPTION OF INSTRUMENTS FLOWN ON BALLOONS AND ROCKETS
SUMMER 1965 -- AURORAL ZONE FLIGHTS
FLIN FLON AND FORT CHURCHILL, MANITOBA, CANADA

FS -- Two scintillation detectors, both collimated to remove scattered x-rays. One detector is a thin NaI(Tl) crystal 1.375" diameter to measure with high resolution x-ray energies from 15 to 90 keV. The output pulses are analyzed into eight channels of energy discrimination. The other detector is a 3" diameter crystal for high time resolution studies. The output is connected to two log count rate meters, then to high frequency subcarrier oscillators. The energy channels are 20-40 keV and >40 keV. Pressure depth of the balloon is measured with a very sensitive aneroid device.

FL -- These units contain a three inch diameter scintillation nearly identical to the one in the FS units. The two energy channels are 20-40 keV and >40 keV. These units are used on small balloons and were particularly important in guiding the rocket firings at Fort Churchill.

DR -- This unit carriers four identical scintillation counters, 3" diameter and collimated to look at small adjacent regions of the atmospheric layer which stops electrons precipitating from the Van Allen Zones. The spatial resolution achieved with this unit is about a 30 km diameter circle at the 100 km high stopping layer.

SL -- Eight channel energy spectrum measurement 15-90 keV with 1" diameter NaI(Tl) scintillation crystal. The rockets carried two scintillation counters for detecting electrons 50-400 keV. One was oriented along the axis of the rocket, the other at right angles to the rocket's axis. Two channeltrons were carried to detect electrons 5-10 keV and 10-20 keV. A geiger-mueller tube detected electrons above 25 keV. A photodiode to detect the sun verified the operation of the nose cone jettison. A two axis magnetometer provided the rocket's aspect with respect to the local magnetic field.

SUPPORT

The support of this complex field effort was shared among three government agencies as follows:

NASA: Provided four NIKE-APACHE vehicles, range support, instrumentation packs, nose cones and telemetry packs. Funds from Grant NsG-387 were used to construct scientific payloads for four rockets and for ten balloons.

ONR: Assistance in contracting for balloon launch services at Flin Flon and other administrative support; provided helium, pibals, and theodolites; provided transportation for balloons, helium and field support equipment. At Churchill, ONR furnished ten 100,000 cubic foot balloons and helium.

NSF: Provided funds needed for salaries, equipment and supplies to construct flight units used at Flin Flon. NSF funds will be used to reduce and analyze data from the Flin Flon series of flights.

SUMMARY OF FLIN FLON BALLOON FLIGHTS -- 1965

Flight Number	Date of Launch	Universal Time of Launch	Size of Balloon in Million Cubic Feet	Type of Instrument Carried by Balloon	Universal Time and Date Data Reception Ended	Simultaneous with Flights
510F	8 Aug.	1141 UT	2.9	FS	0200UT 9 Aug.	-
511F	12 "	1040	0.25	FL	0700" 13 "	-
512F	16 "	1015	2.9	FS	0600" 17 "	-
513F	19 "	0904	2.9	DR	2230" 19 "	514F
514F	19 "	1035	2.9	FS	0030" 20 "	513F
515F	21 "	1018	2.9	FL	0300" 28 "	-
516F	27 "	1032	2.9	FS	2400" 28 "	560C
517F	5 Sept.	0909	2.9	FS	0300UT 7 Sept.	-
518F	14 "	0226	2.9	FS	2200" 14 "	-
519F	16 "	1012	2.9	DR	0500" 17 "	520F,563C;14.234
520F	16 "	1211	2.9	FS	0500" 17 "	519F,563C;14.234
521F	17 "	1143	0.25	FL	2400" 17 "	564C,565C;14.235
522F	18 "	0804	0.25	FS	2000" 18 "	566C
523F	19 "	0622	2.9	FS	1800" 19 "	524F
524F	19 "	0950	2.9	DR	1930" 19 "	523F
525F	20 "	0405	2.9	FS	2100" 20 "	567;14.236, 14.237
526F	21 "	0445	2.9	FS	1500" 21 "	-
527F	24 "	1117	2.9	DR	2300" 24 "	-

SUMMARY OF FORT CHURCHILL BALLOON FLIGHTS -- 1965

Flight Number	Universal Time and Date of Launch	Size of Balloon in Million Cubic Feet	Type of Instrument Carried by Balloon	Universal Time and Date Data Reception Ended	Simultaneous with Flights
560C	1130UT 27 Aug.	0.1	FL	0245UT 28 Aug.	516F
561C	0218 15 Sept.	0.1	FL	0530 15 Sept. (Premature cutdown)	
562C	0125 16 "	0.5	SL	1000 16 Sept.	
563C	1132 16 "	0.1	FL	2100 16 "	Rocket 14.234,519F,520F
564C	0324 17 "	0.1	FL	2000 17 "	Rocket 14.235,565C,521F
565C	1058 17 "	0.1	FL	0600 18 "	Rocket 14.235,564C,521F
566C	1051 18 "	0.1	FL	0300 19 "	522F
567C	1102 20 "	0.1	FL	2000 20 "	Rocket 14.236,14.237; 525F

SUMMARY OF FORT CHURCHILL ROCKET LAUNCHINGS -- 1965

Vehicle Type	Vehicle Number	Universal Time and Date of Launch	Vehicle Performance	Experiment Performance	Simultaneous with Balloon Flights
Nike-Apache	14.234	1404UT 16 Sept.	Apache did not ignite	-	563C,519F,520F
" "	14.235	1544 17 "	Excellent	Excellent	564C,565C, 521F
" "	14.237	1410 20 "	Apache exploded	-	567C,525F
" "	14.236	1608 20 "	Excellent	Excellent	567C,525F